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Major steps of the change process include research, development, diffusion, and adoption, each with its specific objective and relation to change. Each of these steps can be further categorized into a number of particular activities by which each step is accomplished. The kinds of educational research performed in the United States are influenced by a series of eight dimensions, which characterize the research establishment as loosely organized, university based, individually directed, theory oriented, experimentally committed, of a psychostatistical tradition, of a part-time nature, and federally funded. Resultant problems include research not utilized, linking mechanisms between research and practice almost nonexistent, and training programs for researchers inadequate. Corresponding lacks contribute to the effectiveness of development, diffusion, and adoption. Successful diffusion of Title III project innovations, accounting for the nature of the adopter, involves the objective employment of seven diffusion strategies in combination with six diffusion techniques. (JK)

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THE BASIS FOR EDUCATIONAL IMPROVEMENT

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OFFICE OF EDUCATION

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THE BASIS FOR EDUCATIONAL IMPROVEMENT

Egon G. Guba

This is a seminar on innovation and education. The press release announcing it describes the seminar as an attempt "to discuss, evaluate, and enlarge our national effort to improve elementary and secondary education in the United States." Many of you in this audience are Directors of Title III projects, which represent one segment of this national effort. Other segments include the university-based research and development centers, the national network of regional educational laboratories, the research and development programs of the U. S. Office of Education, and the many projects conducted by state departments of education and local school systems.

In my remarks today I should like to take a look at this national system and make some comments about the way that it is working. Specifically I should like to do the following:

1. Develop a model of the process of educational change, which will afford a framework for viewing what is happening.

2. Consider what existing agencies and institutions are doing to carry out each step which the model mandates, and indicate which steps do not seem to be taken care of adequately.

3. Give some detailed attention to one step which seems to be within the special purview of Title III programs.

A Model of the Change Process

My colleague, David L. Clark, and I have been working on various representations of the change process for a number of years. In that time

we have published several different versions[1] of change process models as our concepts have matured and as our critics have become more vocal. I shall attempt yet another version today, for which I shall have to assume sole responsibility.

Essentially we see the change process as consisting of four major phases or steps: research, development, diffusion, and adoption (Figure 1).

MAJOR STEPS OF THE CHANGE PROCESS
RESEARCH
DEVELOPMENT
DIFFUSION
ADOPTION

Figure 1

Each of these four phases has different objectives, and a different contribution to make to change. Let us consider each in turn.

Research. Research activity, (Figure 2) has as its basic objective

A. STEP: RESEARCH
B. OBJECTIVE: ADVANCEMENT OF KNOWLEDGE
C. RELATION TO CHANGE: ONE BASIS OF INVENTION

Figure 2

[1] See for example our papers, "An Examination of Potential Change Roles in Education," NEA-CSI Seminar on Innovation in Planning School Curricula, Aerlie House, Virginia, October, 1965; and "Effecting Change in Institutions of Higher Education," UCEA International Inter-Visitation Program, Ann Arbor, Michigan, October, 1966.

the advancement of knowledge. The researcher is not concerned, nor should he be, with whether or not his research has an evident practical application. He needs freedom to pursue his ideas wherever they lead; he needs to be free to fail on occasion; he needs to be free from pressures for an immediate payoff.

Despite this apparent lack of connection between research and practice, research does have an important part to play in relation to change; viz., it can provide one basis for invention. Obviously solutions to educational problems will be based upon a variety of sources: experience, expert judgment, and testimony, to mention three more prominent competing factors. But it is clear that relevant research can play an important role. In deciding what to do, for example, about the reading difficulties that beset many culturally disadvantaged children in inner cities, one could hardly ignore existing research on reading, on cultural differences, on motivation, and on development. In the absence of relevant research the development of problem solutions will go on because it must, but no one would doubt that developments adequately informed by research would turn out to be better than developments not informed by research.

Development: The development activity has as its basic objective the identification of operating problems and the formulation of solutions to those problems (Figure 3). The developer, unlike the researcher, is most acutely concerned with practice. It is his job to make practice conform to the highest ideals that can be set for it, to be constantly probing the system to determine what, if anything, is keeping it from functioning at its best, and then to devise new approaches and techniques

A. STEP:	DEVELOPMENT
B. OBJECTIVE:	IDENTIFY OPERATING PROBLEMS AND FORMULATE SOLUTIONS
C. RELATION TO CHANGE:	PRODUCES, ENGINEERS, PACKAGES, AND TESTS THE INVENTION

Figure 3

to ameliorate or eliminate whatever problems he may identify. In devising such problem solutions the developer borrows heavily wherever he can--from research, from experts, from his own experience.

But development implies more than just coming up with an answer. The answer must be one that will work in the real world. It must be one that can be adapted into the system. It must be one that is usable by the personnel available. It must get results. Thus development involves production, engineering, packaging, and testing a proposed problem solution or invention.

Diffusion. The most potent solutions that man can devise to overcome his problems have little utility if practitioners are not informed about them, or if they have little opportunity to discover that which they need to know about how the solutions work. The purpose of the diffusion activity, (Figure 4) is to create awareness and to provide opportunities for the assessment of the invention along whatever dimensions the potential adopter may feel necessary. Diffusion, in short, makes the invention available and understandable to the practitioner.

A.	STEP: DIFFUSION
B.	OBJECTIVE: CREATE AWARENESS; PROVIDE FOR ASSESSMENT OF INVENTION
C.	RELATION TO CHANGE: MAKES INVENTION AVAILABLE

Figure 4

Adoption. The purpose of the adoption activity, (Figure 5) is to adapt an invention to the local situation and to install it. This is by

A.	STEP: ADOPTION
B.	OBJECTIVE: ADAPT AND INSTALL THE INVENTION IN A LOCAL SCHOOL SETTING
C.	RELATION TO CHANGE: ESTABLISHES AND INSTITUTIONALIZES INVENTION

Figure 5

no means an easy task. Every situation has its own peculiarities, so that it is unlikely that an invention can simply be slipped into place without considerable modification to itself, to the system, or to both. Further, no prudent local administrator should agree to an innovation without arranging for some kind of trial. When the invention passes this test there is still the matter of assimilating the invention as a component part of the system. This assimilation may involve the training of local personnel, arranging appropriate scheduling, modifying available space, and the like. The adoption process therefore establishes the invention as part of the ongoing program and, over time, converts it into a "non-innovation."

* * *

I have found it instructive, in thinking about these several stages of the change process, to develop a taxonomy of activities at each step that indicates what the researcher, the developer, etc., actually do in carrying out their missions. Again, we may consider each of the four phases in turn.

Research. It will be sufficient for present purposes to classify all possible research activities into four categories which I shall term depicting, relating, conceptualizing, and testing. This taxonomy, (Figure 6) is not generated in any systematic way but emerges from the

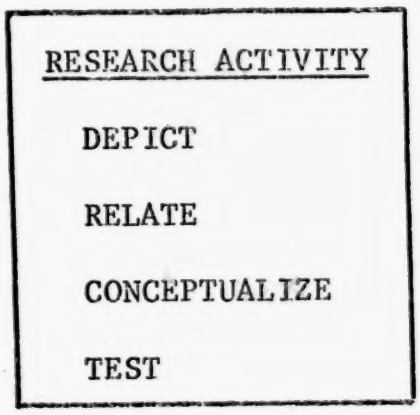

Figure 6

following chain of reasoning:

When a researcher approaches a new topical area about which little is known, there is little that he can do other than describe the phenomena of interest. This description may take either qualitative or quantitative form. So for example a researcher might describe a group as being composed of both boys and girls, or as consisting of 67 per cent males. I shall use the term depict to refer to such a general description.

After a sufficient amount of depiction takes place it becomes possible for the researcher to relate depicted entities. So he may note

that lipstick is worn exclusively by females, or that seven out of ten females wear lipstick while zero out of ten males wear it. He may also note that cancer of the lung seems to be related to cigarette smoking or that the correlation of height and weight is 0.71. When the researcher becomes very clever with relationships he is able to turn them on end and, by the methods of factor analysis, deduce new categories for depiction.

A sufficiently developed network of relationships makes it possible to suggest reasons for the relationships. Why do certain phenomena tend to occur together? Why is lightening always followed by thunder? These questions lead directly to conceptualization, which we may regard as attempts to account for the observed depictions and relations.

These efforts at explanation may be tested to further determine the validity of the conceptualization. To the extent to which hypotheses are borne out, the formulation may be regarded as valid. In this testing process many of the same techniques used in the depicting and relating stages may be used again; typically, however, experimental methodology is employed which tests the hypothesis in a context-free (i.e., controlled) environment while holding the possible effects of other factors in abeyance.

The reconstructed logic of the research process is thus as follows: The aim of research is understanding. Understanding may be said to be achieved when a theory or taxonomy permits an explanation of the phenomena of interest, and of the relationships they bear to each other. Theories are built initially from systems of depictions and relations. The presence of the imperfect theory so devised makes possible more refined

conceptualization. Further tests will confirm or deny the validity of the refinements. The four steps of depicting, relating, conceptualizing, and testing, successively repeated, will thus produce a very sophisticated science over time.

Development. Development activity may also be conveniently broken down into four categories which bear a curious similarity to the four categories of research. I shall term these development categories (Figure 7) depict, invent, fabricate, and test. They are derived by the same sort of intuitive logic as are the research categories.

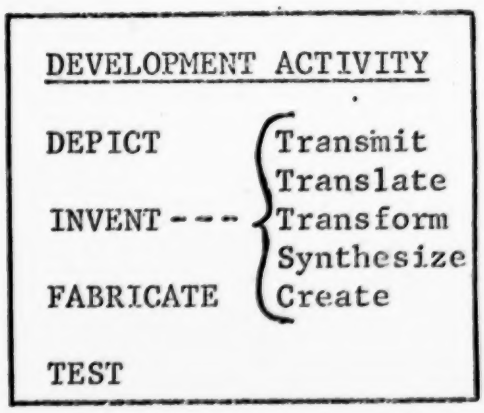

Figure 7

Development begins with the identification of problems. The developer is concerned with causing practice to conform to the highest ideals which he can imagine, but of course it never does. Certain desirable objectives are not reached, while other goals, perhaps even undesirable ones, are in fact attained. Those desirable goals which are attained may be achieved only imperfectly; there is always room for improvement. Whole new goals may become apparent for which the system makes no allowance, or older goals once considered important become less so. All

of these factors require some alteration in the system. The developer's first job is thus to depict the state of affairs so that problems can be identified.

Problems call out for solutions, and the developer's next task is to invent them. Now invention may take a variety of forms. First, it is conceivable that a solution already exists and simply needs to be applied. Perhaps a direct analog is known and simply needs to be adapted. Possibly an indirect analog exists which can be converted into usable form. Or, the elements from which a solution may be devised may exist but may need to be appropriately combined to yield a solution. Finally, it may be necessary to invent a solution de novo. We may speak of transmitting, translating, transforming, synthesizing, and creating to describe these five different possible ways of arriving at a proposed problem solution.[2]

The fact that a solution is identified by whatever means does not signify that it is ready for application. Merely hitting upon an idea like the initial teaching alphabet (i/t/a) does not make it possible to begin using it at once. Materials have to be developed. These materials have to be combined into appropriate sequences. The technique must fit into other ongoing school activities. I will call all of these activities fabrication; the term is intended to cover the entire gamut of engineering and packaging phases that may be required to make the innovation "market ready," as it were.

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[2]The three terms transmit, translate, and transform were coined by the Committee on Research Utilization of the American Educational Research Association to describe three ways in which research findings can be moved into practice. The terms have a somewhat different connotation here.

Finally, the proposed solution must be field tested. It was devised to overcome some problem; does it in fact succeed? Should some refinements be made? Questions of this kind can be answered only through a comprehensive trial. And this trial must take place in authentic school situations; otherwise the applicability of the findings to the real world of education are dubious indeed.

The reconstructed logic of development is thus as follows: the developer, through a continuous monitoring of operational data (akin to process control), identifies particular operational problems which require solution. He invents a solution by transmitting, translating, or transforming already existing solutions, by synthesizing solutions from known but previously uncombined components, or by creating solutions de novo. In all of these processes he may look to research for guidance but research will be but one of several competing inputs. The invented solution is engineered into usable form, and finally is tested in a real school situation. It is then ready for warrant to the schools for use.

The fact that both research and development activities begin with depiction and end in testing creates an appearance of similarity between the two processes which is quite misleading. These two phases have entirely different objectives and make quite different contributions to the change process. Nevertheless drawing a parallel is tempting. I have juxtaposed the research and development taxonomis in Figure 8 to make this point clear. Thus development is often viewed as applied research, or the techniques of research are viewed as appropriate to certain developmental steps, particularly testing. Typically, no differences are identified by the

RESEARCH ACTIVITY	DEVELOPMENT ACTIVITY
DEPICT	DEPICT
RELATE	INVENT
CONCEPTUALIZE	FABRICATE
TEST	TEST

Figure 8

researcher between the "testing" of the research phase, which implies the experimental testing of hypotheses, and the "testing" of the development phase, which implies field testing or evaluation of the developed innovation.

The latter confusion is especially disastrous. The assumptions of the experimental method are simply inappropriate to the real world of education. While experimental designs insist on control, innovative operating systems must insist upon flexibility and change. While traditional techniques employ product measures, innovators and decision makers in operating systems need process data. While the experimentalist seeks to know what happens in the context-free environment of his laboratory, the practitioner must know what goes on in the septic world of the classroom. The fact that traditional evaluation designs, based on experimental method, do not work well in the classroom is well known to any practitioner who has ever attempted to evaluate a Title I or Title III project. We may only hope that new designs based on appropriate assumptions will soon be available for use. This is a developmental task in its own right, and one which will require the creation of de novo solutions.

Diffusion. In thinking about diffusion I have found it most convenient to think not of a series of necessary steps through which the diffusion agent must go (as is the case with the taxonomies presented for research and development), but of a series of techniques which he can use in discharging the diffusion function. It seems to me that there are essentially six basic ways in which diffusion can occur (Figure 9):

DIFFUSION ACTIVITY
TELL
SHOW
HELP
INVOLVE
TRAIN
INTERVENE

Figure 9

1. Telling. Telling is a form of communication which involves the word. The word may be written, as in newsletters, papers, monographs, books, articles, and the like; or it may be spoken, as in conferences, speeches, conversations, etc. My essential diffusion mode today is telling, for example.

2. Showing. Showing is a form of communication which involves a direct confrontation with the phenomena of interest, as in a planned or casual observation, or in actual participation. It may involve structured experiences such as demonstrations or simulations; or it may involve looking

at materials or displays such as pictures, slides, films, dioramas, realia, and the like.

3. Helping. Helping consists in a direct involvement of the diffuser in the affairs of the adopter on the adopter's terms. It may take the form of consultation, service, trouble-shooting, and the like. In the process of rendering help the diffuser may find ample opportunity to make a case for an invention appropriate to the problem for which help is being provided.

4. Involving. Involving takes the form of an inclusion or cooptation of the adopter. It may enlist the adopter in assisting with the development, testing, or packaging of an innovation; in acting as a "satellite" or agent to cause others to adopt; in contributing the problems to which innovative solutions are to be sought; and the like.

5. Training. Training takes the form of familiarizing adopters with features of a proposed innovation, or of assisting them to increase their skills and competencies or to alter their attitudes. It may be accomplished through formal university credit courses, institutes, workshops, internships, apprenticeships, extension courses, local in-service training, "T-sessions," and similar experiences. Training may involve telling, showing, helping, or involving, but differs from these other techniques in that the adopter makes a formal commitment to learn by allowing himself to become involved in the training.

6. Intervening. Intervening consists in the direct involvement of the diffusion agent on his own terms, not those of the adopter. It may take the form of mandating certain actions (e.g., adopting a statewide

textbook), inserting certain control mechanisms (e.g., instituting a state-wide testing program), or of intruding certain economic or political factors (e.g., arranging the purchase of language laboratory equipment or causing board dismissal of an uncooperative teacher).

The reconstructed logic of the diffusion process is thus as follows: The diffuser has the task of building awareness and understanding of an innovation and causing potential adopters to consider its features with a view to possible adoption. To discharge this function he has essentially six techniques at his disposal: telling, showing, helping, involving, training, and intervening. He will use any combination of these techniques to cause favorable consideration without resorting to hucksterism or unethical manipulation. He sees himself as a person opening viable professional alternatives to the potential adopter with a problem to solve.

Adoption. The purpose of adoption activity is to shape and install an innovation within a particular local setting. This phase of the change process seems to have received little conceptual attention from anyone; it is perhaps the most muddy of the four. It seems to me that at least three major steps are involved, with the second of these being divided into several sub-steps (Figure 10) as follows:

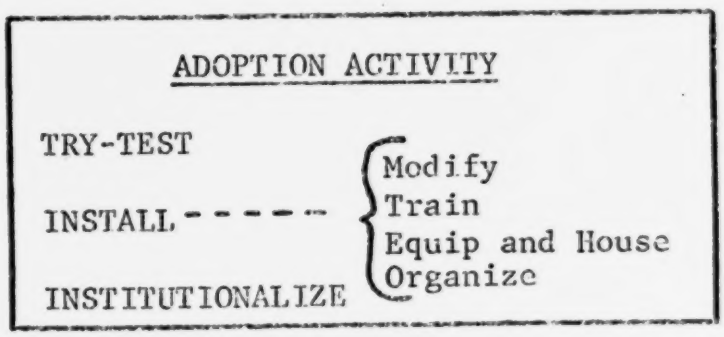

Figure 10

1. Trial. No prudent administrator will permit the installation of an innovation on a permanent basis without having convinced himself that it will perform as claimed. Indeed, a local trial is mandatory even when national assessments have indicated that the innovation performs well on the average, for the obvious reason that the situation in which installation is proposed may not be average. Local variations must be taken into account.

2. Installation. When an innovation proposed for adoption has proved itself through a local trial, it then becomes necessary to arrange for its installation on a building wide or system wide basis. At least four areas of concern must be attended to:

a. Modification. No innovation will fit exactly into a local school situation for which it was not explicitly designed. Decisions will have to be made whether the fit can best be accomplished by modifications in the innovation itself or in the school situation. If for example the innovation requires teachers with particular skills but teachers with these skills are simply not available, some modification in the innovation will be required.

b. Training. Personnel expected to use the proposed innovation must be trained. No teacher will willingly risk his reputation before a class with a technique about which he is unsure. More importantly, no administrator should be willing to permit a teacher to adopt a new technique without proper training for use, lest through lack of knowledge he should fail to take full advantage of whatever additional benefits are expected to accrue.

c. Facilities. Many innovations require particular kinds of physical arrangements. Typically a school adopting such an innovation will not be suitably housed for the purpose or may not possess appropriate equipment. Flexible scheduling or multiple-size grouping cannot occur in a building arranged for conventional size classes of 25 or 30.

d. Administration and organization. The proposed innovation may have important administrative or organizational consequences. One innovation which I recently shepherded into a school had the interesting side effect of causing a near revolt among the custodians, because of the additional time required to clean the equipment that had to be placed into each room. Problems in scheduling, in budgeting, in staffing, in organizing may all produce headaches for the administrator. Unless these possibly disruptive consequences can be foreseen and obviated, the result may be a failure of an otherwise useful innovation.

3. Institutionalization. Ultimately the innovation must be assimilated into the ongoing program. At some time it must cease to be viewed as an innovation and become an integral and accepted component. It is not clear to me what steps might be taken to insure institutionalization. Sometimes I feel that the most important factor may simply be the passage of time. Obviously, the lack of awkward incidents in relation to the innovation is helpful and the more quickly the spotlight can be taken off the invention the more quickly it is likely to become accepted.

The reconstructed logic of the adoption process is then as follows: a proposed solution to an urgent local problem is given a local trial under limited conditions. If the innovation passes this test it may then be made ready for use throughout the building or system. This installation process may require modification in the innovation, as indicated by the local trial; it will almost certainly require certain modifications in facilities, administration, and organization. Training of necessary personnel is also mandated. Finally, once the innovation is operating, it is wise to divert attention from it to other problems to insure that institutionalization will occur in the minimal time.

An Analysis of Existing Efforts to Carry Out Each Phase of the Change Process

We come then to the second major question to which I wish to address myself today. If the model that I have presented has validity we need to be concerned with who will carry out each step. What mechanisms now exist, or what mechanisms are needed, to do the research, the development, the diffusion, and the adoption that the model calls for? How successful are existing approaches?

Research. The research enterprise in the United States may be characterized along a series of dimensions which are crucial in determining the kinds of research done, and by whom. These dimensions are as follows (Figure 11):

CHARACTERISTICS OF THE RESEARCH ESTABLISHMENT

1. LOOSE ORGANIZATION
2. UNIVERSITY BASE
3. INDIVIDUAL DIRECTION
4. THEORY ORIENTATION
5. EXPERIMENTAL COMMITMENT
6. PSYCHO-STATISTICAL TRADITION
7. PART-TIME NATURE
8. FEDERAL FUNDING

Figure 11

1. Loose organization. A wide variety of agencies and individuals conduct educational research, but without any central organization or co-ordination. This arrangement has the obvious virtues of flexibility and simplicity but also suffers from the fact that it is difficult to enlist the efforts of a number of persons or agencies in pursuit of a common research objective. Communication becomes difficult, and resources cannot be allocated in an optimal manner. Most dysfunctional from the point of view of the practitioner is that the loose organization does not afford any obvious input or output channels. It is hard to get to the research community with ideas or problems, and it is equally hard to get back relevant information.

2. University base. Most educational research is conducted by university personnel, rather than by persons employed by other agencies such as local school systems. There are many advantages to this arrangement.

The university has the professional manpower and an inexpensive labor pool in the form of graduate students. The university's traditional posture makes possible the high risk taking and sanctioned freedom to fail required by the researcher. On the other hand, the university's traditional interest in new and basic knowledge militates against the more practical research which the real world of education needs.

3. Individual direction. Topics for research are chosen predominantly on the basis of the interests of the individual investigator. Thus researchers are free to pursue that which concerns them most deeply and to which they are most committed. On the other hand, this posture militates against programmatic, team research efforts which have so effectively dealt with practical problems in other fields such as medicine, nuclear energy, or space flight. The pressing problems of education might be attacked in a similar way but probably will not be so long as individual choice is the dominant determiner of what will be studied.

4. Theory orientation. Much educational research is conducted by persons from related social and behavioral disciplines such as psychology and sociology. The research thus tends to relate to the theories of those disciplines (for the testing of which the schools serve as an ideal "natural laboratory") rather than to the solution of practical problems. This approach obviously has great payoff for the related discipline but little for the practice of education.

5. Experimental commitment. The experiment is viewed almost universally as the proper format for scientific inquiry. Non-experimental approaches are seen as inferior or misleading. This is not surprising,

since the experimental method has in fact achieved great breakthroughs in other areas of science, and since the methods and instruments of experimentalism are well explicated and available. On the other hand it is apparent that the assumptions underlying the experimental method are not well met in the world of educational practice. As a consequence the application of the method may often lead to trivial or misleading findings. For example, the assumption that a treatment will remain essentially invariant throughout a trial is very difficult to meet when the treatment itself must be subject to continuing improvement. Unfortunately, better techniques still remain to be developed.

6. Psycho-statistical tradition. Educational research is conducted in the main by persons whose training is heavily based in educational psychology, statistics, and measurement theory. This uniformity leads to ease of communication among researchers and certainly makes it simple to devise training programs. In general, research is afforded a cohesiveness and focus by this means that would be hard to achieve in other ways. On the other hand, this general agreement upon one tradition serves to exclude other possible traditions. Problem areas and methods that do not fit into the prevailing orientation receive little serious attention. Skills appropriate to these other areas will neither be developed nor transmitted. New research roles will not be developed.

7. Part-time nature. Most educational research is conducted by persons who have other demanding duties, usually teaching. Very few persons are able to devote as much as one-third of their time to research. Some universities feel that this is an ideal arrangement; they claim that

students benefit from being exposed to the thinking of "cutting edge" investigators, that the researcher benefits from the necessity of organizing his thinking for presentation, that a one-third time commitment to research is about all that one person can handle comfortably anyway, and that researchers need time away from their research to rejuvenate themselves and to permit unconscious conceptualization (often called "incubation") to occur. But it is difficult for the researcher to maintain conceptual continuity and sustained effort under conditions of continuous distraction. Usually either research or teaching begins to be viewed as an avocation. Certainly the massive team efforts needed to attack education's problems efficiently are not likely to be mounted under these circumstances.

8. Federal funding. Most educational research is funded by the federal government. Expenditures by foundations, by other levels of government, or by local school systems, while substantial, are small by comparison. This policy makes sense in that the tax dollar spent for research can be spread most efficiently, and because the researcher seeking support has a highly visible agency to which to turn for help. On the other hand, the ever-present specter of federal control has generally kept federal moneys from being spent in a systematic and coordinated way. Communication has not been substantially improved by federal funding, nor have linkages between the research community and other parts of the educational establishment been well developed.

* * *

The existence of this particular pattern for conducting research has both good and bad consequences. There is no doubt that American educational research is in the vanguard in terms of scope, creativity, flexibility, rigor, excitement, and support. But in relation to educational practice this form of organization also gives some cause for serious concern.

First, it is clear that research is not utilized by practitioners. It has not been cumulative to any degree, so that the practitioner finds either a paucity of data, or competing and conflicting data, more often than he finds definitive and helpful data. Nor has research been programmatically oriented; almost all research activity takes the form of ad hoc project efforts. Thus we do not see the massive ventures that characterize the fields of health or space exploration, for example. Further, research has been quite unresponsive to practical problems, perhaps because of the lack of appropriate input and output channels.

Second, mechanisms for linking research with the world of practice are almost non-existent. Research has not developed new specializations to meet some of these linking needs, perhaps because practice is generally viewed as a low-status activity by university-based researchers. In fairness to the researcher we might point out that the low supply of funds which has characterized research until very recently, and the lack of personnel which continues to plague it, have dictated a policy of emphasis upon central rather than peripheral matters, and the research community clearly, and properly, regards the production of new knowledge as more central than the development of practical applications.

Third, programs for training additional researchers and/or new research specializations are also inadequate. Practicing researchers are being asked to perform functions for which they were not adequately trained (e.g., conduct field evaluations or develop quality control programs) and the new roles that are emerging are posing entirely new training demands. These new needs do not fit well into the traditional rubrics and hence are assimilated into the system only with great difficulty.

Thus, in response to the question, who is doing educational research and with what success, we must answer with some ambivalence. Obviously there is a large educational research establishment, and it is carrying on very successfully the kinds of activities to which it has been traditionally committed. In that sense there is great success. On the other hand, the establishment is not influencing the world of practice to any great degree. Certainly, as my colleague Henry M. Brickell has suggested, "school practice in this nation cannot be understood as being based primarily upon research."[3] For the foreseeable future, it seems likely that advancement at other stages of the change process will continue to be relatively independent of what happens at the research stage.

The federal government is making one effort to circumvent this circumstance through the establishment of research and development centers,

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[3]Brickell, Henry M., "Role of Research in the Innovation Process," in Egon G. Guba (Ed.), The Role of Research in Educational Change in the United States, in preparation for delivery at the UNESCO Conference on The Role of Research in Educational Change, Hamburg, Germany, July 19, 1967.

such as those at the Universities of Pittsburgh, Oregon, and Wisconsin (to name those first established). Thus far these centers have shown little capability for shaking off the traditional constraints, particularly in terms of developing programmatic foci which can be studied systematically and in depth. It is undoubtedly too early to predict whether such developments will occur later. In the interest of making research a more viable source of innovations we shall fervently hope so.

Development. The whole idea of development is new to education. The kind of analysis just made for research is not possible in this area, but some general observations can be made.

Until a few years ago it had not occurred to anyone in the educational establishment that development was a necessary function. It was commonly assumed by practitioners, when they thought about it at all, that development was properly the concern of the researchers; after all, who was in a better position to indicate the utility of research for practice than the person who had done the research? Similarly, the researchers felt that it was up to the practitioners to derive applications from research, for who was more conversant with the problems that require solution? As it became apparent, particularly during the fifties, that neither camp took the development responsibility seriously, both sides took turns blaming the other for the fact that research was not getting into practice.

The plain fact is, of course, that development is a very complicated process which neither practitioners nor researchers are particularly competent to carry out. Experience gleaned from industry indicates that from five to eleven times as much investment is required to develop a

practical application from a basic research finding than was necessary to produce the basic idea in the first place. High level specialists are required to do the job. Moreover, development depends not only upon the availability of relevant basic research but upon a host of other factors as well: the availability of resources, institutional support, experience, practical judgment, political factors, and the like. Research data provide only one of several critical inputs, and the blending of these inputs requires more specialized skill than either researchers or practitioners commonly possess.

Initial attempts at development in education occurred gradually and without a clear realization of what was happening. I am sure that the persons following the lead of Jerrold Zacharias in the development of the PSSC physics materials were scarcely aware of what a vanguard group they were. The several other curriculum development groups, mainly funded by NSF in those early days, were certainly more interested in updating content than they were in establishing development patterns which others might emulate. But their pattern did seem to prove successful, and it was soon emulated, particularly in the new course content improvement projects of the U. S. Office of Education.

In more recent months we have seen further systematic attempts to establish development agencies. Clearly the research and development centers have a mandate to turn their research into practice. But as we have seen, successful development involves a great deal more than the mere availability of relevant research. We may well wonder therefore whether the primarily research oriented R & D centers will be up to the task. Another similar effort has occurred in the establishment of the

regional educational laboratories, which are mandated to identify and solve educational problems, hopefully through recourse to research but by other means if necessary. Thus far the laboratories are too new to make it profitable to venture a judgment about their probable level of success. However, if the recent furor in the Congress and in the Bureau of the Budget may be taken as any indication, it would seem that all is not well. We may hope that the establishment of a new advisory group under the chairmanship of Francis S. Chase, and the appointment of an official within the Office of Education (Norman Boyan) to take firmer leadership in regard to both the laboratories and the research and development centers, will produce more acceptable results.

It seems that no existing agencies have responsibility for the full range of development activities indicated by the change process taxonomy. The depicting function seems to be especially neglected. While both regional laboratories and Title III projects were mandated to make needs surveys of their regions, it is clear that these surveys were carried out in a most perfunctory way, and without the benefit of hard data in many cases. (I should note at once that this is not the fault of the agencies involved so much as it is of the Office of Education, which mandated these surveys under incredible constraints of time and resources.) More importantly, even when well done, these surveys provide but a static "snapshot" of the situation at any moment rather than a dynamic "motion picture film" over an appreciable time span.

The invention function is perhaps better managed than the others, although certainly not nearly as well as it should be. Funds are available

for improvement projects and several agencies, including the new industry-education combines as well as the regional laboratories and research and development centers, are beginning to undertake massive improvement projects. Yet a conceptual underpinning for such activity is still missing. We still know far too little about effective ways of creating new solutions or even of transmitting, translating, or transforming known solutions.

Fabrication will probably be handled best by the industry-education combines, since these typically involve publishers and manufacturers of hardware that can be used to good effect. The publishing industry has shown a great deal of ingenuity in the past in placing its materials into interesting and novel formats and will probably continue to do so.

In the area of testing we come again upon a quite underdeveloped area. I have alluded earlier to the fact that existing evaluation designs do not seem to be too appropriate for the real problems of education. We may also be concerned that if much of the fabrication is carried on by commercial agencies, they may be over eager to rush their fabrications into production without the kinds of testing that would assure a professionally warrantable product. Thus both conceptual and consumer protection innovations are needed in the area of testing.

From one point of view the development picture is not too rosy. When one considers, however, how late in the day we determined to undertake development at all, and with what meagre resources we have supported it, we may perhaps be forgiven if we take a more charitable view. Now that education is fully aware of the need for development activities, is apprised of their complexity, and is being aided with resources to get

development activity started, we may hope that within a decade most of the problems I have enumerated will have disappeared.

Diffusion. Diffusion is an activity regarded with some distaste by many members of the educational establishment, particularly the research community. It is often equated with hucksterism, and I suppose, in fairness, that one must concede that a great deal of hucksterism does take place. This fact may be the best argument one can muster in favor of well organized diffusion efforts, however, so that one can be sure that what is being diffused is a viable alternative rather than just another fad.

Traditionally educational diffusion has been the domain of commercial interests, mainly the book publisher. Recently both research and development centers and regional educational laboratories were given some diffusion responsibilities, and these agencies have begun to develop new approaches, although haltingly.

The major diffusion responsibility seems to be falling squarely on the shoulders of Title III projects. There is a school of thought that suggests that research and development centers should be concerned with research, regional educational laboratories with development, and Title III projects with diffusion. This is a formulation with which I am in essential agreement, perhaps because this division of labor would fit my change model so well. There would be at least three of the change stages, then, for which institutional responsibility would be firmly fixed. This formulation also seems to be supported in the Office of Education. The OE Manual for Project Applications for Title III grants clearly defines as

one of the primary objectives of the program to "create an awareness of new programs and services of high quality that can be incorporated in school programs."[4] The manual also points out that "PACE seeks to . . . demonstrate worthwhile innovations in educational practice through exemplary programs."[5]

Since diffusion seems to be such an important responsibility for Title III projects, and since so many of the persons in this audience are Title III project directors, I would like to make rather extensive comments on the subject. For that reason I will leave off further discussion of diffusion at this point, returning to this topic in a third portion of this paper.

Adoption. Adoption is the least well developed activity on the change continuum.

If there is an existing agency which might be said to be concerned with this phase, I suppose it is the traditional university-based field service bureau. Such bureaus have typically been established to help local schools solve their problems, hopefully in an innovative way and applying the most up-to-date information and methods. But such service bureaus have not been very successful, in part because there were not enough of them to fulfill the need; in part because they lacked the resources, particularly the intellectual resources, to do a thorough job; and in part because they fell into repetitive and mediocre patterns of

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[4]A Manual for Project Applicants. Title III Elementary and Secondary Education Act, U. S. Office of Education, p. 1.

[5]Ibid.

operation that rendered them essentially incapable of behaving resourcefully and innovatively.

One might argue that the adoption task might be an appropriate one to assign to state departments of education. These agencies have suffered from the same lacks as have the university field service bureaus, however, and have been hampered in one important additional way: fear of government control. A state department seeking to help local schools adopt new practices is suspected of having a secret axe to grind. For this reason this route to efficient adoption does not appear very promising either.

A third formula that might be suggested is that the adoption activity should be assigned as a responsibility of the local school. Thus each school district should develop adoption units that can assist local personnel in carrying out the trying, installing, and institutionalizing functions called for in the model. Such a suggestion is attractive because the use of local personnel for this purpose eliminates the possibility of being huckstered, manipulated, or legally forced into adoption. Institutionalization ought to be fairly easy, under these circumstances. But the establishment of such an agency is not something which every school district will be in a position to accomplish. There are probably too few personnel available to accomplish the necessary tasks. Further, and perhaps most importantly, why should every school district establish such a unit? Would this not constitute unnecessary proliferation and perhaps even be open to the charge of wasting tax money? No doubt some groups would soon be heard on that issue.

It would appear, assuming the validity of this analysis, that the last word has not yet been heard on the adoption problem. Perhaps entirely new agencies will be required; if so, these are not yet conceptualized, their sources of funds are undesignated, and the personnel they will require are untrained. Perhaps we will eventually have an ESEA Title VII to provide for this need. However the problem may be handled ultimately, it is clear that until this gap in the change process continuum is closed, we cannot expect school improvement to occur smoothly and effectively.

Title III and Diffusion

Let me return in my final series of comments, to the question of diffusion, which I believe to be at the core of Title III project activities.

The purpose of diffusion activities, as pointed out earlier, is to create awareness and understanding of an invention and to provide opportunities for its assessment. Such a purpose clearly requires that contact be made with the potential adopter, and that the diffusion activity be shaped to fit him. Strategies must be developed which will cause the adopter to accept, or at least seriously consider, the proposed innovation. I should like to suggest that such strategies are determined, in the final analysis, by the implicit or explicit assumptions which are made about the nature of the adopter.

At least seven diffusion strategies are in current use, each of which depends upon a different formulation of the nature of the adopter, as follows (Figure 12):

DIFFUSION STRATEGIES

VALUE

RATIONAL

DIDACTIC

PSYCHOLOGICAL

ECONOMIC

POLITICAL

AUTHORITY

Figure 12

1. A value strategy. The adopter is viewed as a professionally oriented entity that can be obligated to adopt through an appeal to his values. So, for instance, appeals can be made on behalf of "what is best for the children." The Progressive Education movement of the 30's is perhaps the best extant example of this strategy.

2. A rational strategy. The adopter is viewed as a rational entity who can be convinced, on the basis of hard data and logical argument, of the utility (i.e., the feasibility, effectiveness, and efficiency) of the innovation. The term rational is used in a restricted sense here to denote behavior mediated by scientific evidence. It is obvious that a person whose behavior is mediated by political or economic considerations, for example, may also be acting rationally, but this meaning is excluded. An example of the use of this strategy is the diffusion effort of the Philadelphia regional educational laboratory (Research for Better Schools, Inc.) on behalf of the IPI materials (Oakleaf School Innovation developed by the Pittsburgh Learning Research and Development Center).

3. A didactic strategy. The adopter is viewed as a willing but untrained entity, that is, as having the appropriate values, motivations, and the necessary economic resources, but as not knowing how to perform. He can therefore be taught what is needed to achieve adoption. The NSF and NDEA institutes are prime examples of this strategy.

4. A psychological strategy. The adopter is viewed as a psychological entity whose needs for acceptance, involvement, and inclusion can be employed to persuade him to adopt. Care should be taken not to interpret the psychological strategy as one of manipulation; this latter strategy may be more properly subsumed under the political strategy (below) or the value strategy. Psychological strategies are more typically used to persuade the adopter that he has problems to which he must attend, to involve the potential adopter in the development of the innovation, and the like. The COPED project is a good example of the use of this strategy.

5. An economic strategy. The adopter is viewed as an economic entity who can be compensated for agreeing to adopt or deprived of resources for refusing to adopt. NDEA-financed language laboratory equipment is an example of compensation, while the withdrawal of Federal funds from segregated schools is an example of deprivation.

6. A political strategy. The adopter is viewed as a political entity who can be influenced to adopt. One interesting example is that of accrediting associations, which usually attempt to get schools to operate beyond minimum levels required for accreditation. School study councils typically depend upon political influence to attract and retain members.

7. An authority strategy. The adopter is viewed as an entity in a bureaucratic system who can be compelled to adopt by virtue of his relationships to an authority hierarchy. State textbook adoptions or legislated courses are examples of this strategy.

In the earlier discussion of the change process continuum, we developed a taxonomy of diffusion techniques (as distinct from strategies) which diffusion agents might employ, viz.: telling, showing, helping, involving, training, and intervening.

Now it is possible to relate each of these six techniques to each of the seven diffusion strategies, as indicated in Figure 13; the strategies-techniques matrix. It seems likely (with few exceptions) that almost every technique could be adapted to almost every strategy. Thus what one would tell in relation to a rational strategy (scientific facts) is quite different from what one would tell in relation to a psychological strategy (shared experiences). The diffuser following the psychological strategy would design his "showing" less to illustrate solutions to problems than to uncover the enthusiasm of the participating teachers. His training would be concerned less with developing skills than in sensitizing the participants in human relations areas. And so on.

The reasoning that led to the development of Figure 13 and the insights afforded by it illuminate certain critical difficulties that beset current diffusion efforts, including those of Title III projects. Why, given such an impressive array of strategies and techniques, do we not enjoy greater success in diffusing innovations? The following difficulties may be noted:

STRATEGIES

TECHNIQUES	Value	Rational	Didactic	Psychological	Economic	Political	Authority
Telling							
Showing							
Helping							
Involving							
Training							
Intervening							

Figure 13

1. Diffusion techniques are often mistaken for diffusion strategies. This confusion has three disastrous consequences. First, it causes the diffuser to focus on means rather than upon images of the practitioner. Second, it results in the design of a badly-integrated diffusion program; thus the particular techniques that are selected may make only a fortuitous contribution toward getting the adopter to adopt, and they may in fact be working at cross-purposes. Third, it may result in an erroneous utilization of techniques; thus the diffuser may fail to make the adaptations

required for a particular audience because he does not have a clear image of that audience in mind to guide his activities. So he may, for example, insist on filling his newsletters with evaluative information when he should be stressing value patterns.

2. Uni-dimensional strategies are being advocated to the exclusion of other strategies. It is probably reasonable to assume that no single strategy is sufficient to accomplish adequate diffusion. Man is at once a valuing, rational, teachable, psychological, economic, political, and authority-oriented entity. Yet in many instances diffusion strategies are advocated which depend upon the assumption that one of these aspects greatly outweighs the others. So for example, it is not uncommon to find great reliance being placed upon the rational strategy, apparently in line with the cultural faith in the "better mousetrap." This faith continues to be held despite the common experience that schools do not flock to accept a new innovation even when it is clearly superior to anything being used. Other common single-strategy approaches being advocated include the development of "self-actualizing systems" (psychological strategy) or the use of legal mandates (authority strategy). Such single-strategy approaches are likely to be slow and ineffective.

3. Diffusion strategies are typically determined with no consideration about the condition in which the diffuser wishes to leave the adopter. This situation may arise, of course, because the diffuser acts as a mere huckster; hucksterism may "sell" the particular innovation being promoted but may leave the adopter with little residual propensity to adopt again. But even with "well-intentioned" diffusers this difficulty

may arise because of their basic failure to understand that their strategies ought to be generated by a consideration of the adopter. What is it that the adopter should be able to do, to think, or to feel, as a result of having been exposed to a diffusion strategy? Is he to be better trained? More skillful? More knowledgeable? More open? Obviously the wise choice of a diffusion strategy would be considerably aided through careful attention to this factor.

4. Each strategy is subject to certain practical obstructions. The fact that one can formulate strategies consistent with different views that one might hold of the adopter is of course not an adequate assurance that the strategies will work in practice. Indeed, as it turns out, each of the seven strategies is subject to certain practical obstructions that prevent it from being as effective as theory would indicate, or that militate against its feasibility. Some examples of these obstructions include:

a. The value strategy--values are very deep-seated and cannot be altered easily. The resources and effort necessary to cause change to occur by means of this method militate against its widespread use.

b. The rational strategy--busy practitioners rarely have the time and energy to immerse themselves in facts and data sufficiently to be convinced of the efficacy of an innovation on its merits alone, even if the evidence exists.

c. The didactic strategy--trainers with sufficient competence do not exist in the required numbers, nor do the materials necessary to support the training activity.

d. The psychological strategy--the necessity for extensive and intensive face-to-face relationships demanded by this strategy greatly impedes its widespread application, and severely limits the numbers reached.

e. The economic strategy--there are simply not enough resources available to produce all of the needed changes by this approach alone, nor can resources alone make the adopter skilled.

f. The political strategy--mere political motives are suspect in our culture and cannot be used as the sole basis for change in an enterprise as visible as public education.

g. The authority strategy--the educational enterprise is so vast that mere token compliance with a mandated action is often sufficient to avoid negative sanction while not being sufficient to produce a durable change.

5. Existing agencies and mechanisms designed to carry out diffusion activities are typically constrained to use only a segment of the strategy spectrum. Very often these agencies and mechanisms cannot choose from the full array of available strategies, but are constrained to use only certain strategies. So for example a regional educational laboratory, while able to use rational and psychological strategies, is hardly in a position to use an authority strategy. State departments of education, which have a near monopoly on the authority strategy, are not really in a position to use psychological strategies without risking charges of government manipulation.

6. Diffusion agents typically do not have a clear and explicit perception of the strategy they are following. Even if none of the difficulties noted above existed, diffusion activities would probably still not be very effective because diffusion agents have not understood the meaning of the term strategy nor have they identified the variety of strategies available to them in any operational terms. This lack of clear understanding is partly rooted in the confusion between strategies and techniques, but probably stems mainly from the fact that clear analyses of diffusion phenomena do not exist.

I have labored this matter of diffusion a great deal because I believe that it is the crucial problem for Title III projects. If my analysis is correct, personnel concerned with diffusion must go through a number of steps to do an effective job:

1. They must make a careful analysis of the nature of the potential adopters in which they are trying to create an adopting attitude.

2. They must select a strategy or combination of strategies which is consistent with their analysis and which takes account of the state in which they wish to leave the adopter. In all cases strategies must enhance rather than reduce the adopter's propensity to adopt again.

3. They must select a strategy or combination of strategies consistent with the posture and capabilities of the agency which they represent. Rational strategies may make more sense than authority strategies, for example.

4. They must cause the specific techniques which they use to be consistent with the strategy they decide to employ. There is no point in

quoting facts and figures if the only effective way to approach an adopter is to buy him.

I have perhaps been the long way around the barn to make these points. They are simple indeed on their face, but I believe very elusive. The successful diffusion by Title III projects of innovations depends, I am convinced, on their effective application.

Conclusion

I have tried today in labored fashion and overlong form to sketch for you my impressions of how well we are doing in relation to educational improvement. To do that I have had to tell you more than you really wanted to know about the change process, and about existing attempts to fulfill the various requirements of that process. My remarks may easily be interpreted as pessimistic and negative, for I have tended to focus on problems rather than on successes. I could not leave off without assuring you, however, that I consider the case far from hopeless. Indeed, I would say that our progress over the last several years has been remarkable. Surely if we accomplish as much over the next five years as we have accomplished over the last five, the schools of 1972 will be radically different and undoubtedly improved. But the attainment of that goal will take prodigous effort from all of us and at all levels ranging from the most mundane practice to the most esoteric conceptualization. I personally am elated at the prospect; surely this is the most exciting educational time that history has ever witnessed. The challenge is there--we need but meet it.